Prairie Science Class Evaluation Report

2004-2005

Prepared February 2006

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Program Summary

The Prairie Science Class (PSC) is a formal partnership between the U.S. Fish and Wildlife Service's (USFWS) Prairie Wetlands Learning Center (PWLC) and the Fergus Falls Independent School District 544. Its mission is to use the local prairie wetlands ecosystem as an integrating and motivating context to engage 5th grade students in science, math, and writing through real world, field-based learning experiences. Program goals include developing knowledge and skills in math, writing, and science; increasing motivation toward learning; developing problem solving, critical thinking, communication, and technology skills; and fostering character skills and a stewardship ethic. The educational philosophy guiding the PSC is interdisciplinary, experiential learning through authentic, field-based experiences and constructivist approaches.

During the 2004-2005 school year, 100 fifth graders (two morning classes and two afternoon classes) were involved in the PSC, spending two hours each day at the PWLC. While at the PWLC, PSC teachers (two ISD 544 employees) and PWLC environmental education specialists provided field-based instruction in the curricular areas of science, math, and writing through a series of seasonal, integrated units based on the prairie wetlands ecosystem. Students spent the remainder of the school day at the Fergus Falls Middle School, where they received their reading, social studies, physical education, and health instruction.

(Visit http://www.fws.gov/midwest/pwlc for more information)

Students banded mallards during the fall migration unit, building math skills through weighing and measuring the ducks; students also learned wildlife management techniques and the importance of prairie potholes to sustaining waterfowl populations.

Students worked in small groups to assist the USFWS with prairie restoration efforts. Students studied ecological concepts, such as biodiversity and native and nonnative species, and practiced observation and classification skills.

Students conducted winter ecology research projects, presenting their results at a family night held at the PWLC.

Evaluation Methodology

The purpose of this formative evaluation was to identify areas where program improvement was needed and to assess the progress made toward program goals. This evaluation was also used to document program outcomes for stakeholder justification and to support decisions regarding program continuation and expansion. Four questions guided this program evaluation:

1. Have the students attained grade-level proficiency in science, math, and writing?
2. Have the students' science process, problem solving, and their skills in working cooperatively and communicating with others increased?
3. Do the students have a more positive attitude toward learning, a more positive attitude toward the prairie wetlands environment, a stronger stewardship ethic, and a stronger sense of civic responsibility by the end of the school year compared to the beginning of the school year?
4. Did the Prairie Science Class meet the needs of the students and parents, the Fergus Falls School District, and the U.S. Fish and Wildlife Service?

To answer these questions, three data collection instruments were used (see following table). The 100 students in the Prairie Science Class and their parents were the primary source of information for this evaluation. The Fergus Falls Middle School Principal, the ISD 544 Superintendent, the PWLC Supervisory Park Ranger, the USFWS Project Leader of the Fergus Falls Wetland Management District, and the Region 3 Chief of the National Wildlife Refuge System provided information for this report. All data collection through three instruments took place over the 2004-2005 school year. The evaluation was implemented by ISD 544, with assistance from the USFWS in survey administration, data analysis, and report preparation.

Summary of Data Collection and Analysis

Instrument	Instrument Description	Constructs Assessed	Information Source	Time of Implementation	Data Analysis
Minnesota Comprehensive Assessments	Part of the educational accountability system in MN	Math, writing, reading achievement	PSC students (n=96); ISD 544 5th grade students in traditional classrooms (n=96); 5th grade students in MN	March 2005	Independent-samples t test, Descriptive statistics
Skill Self-Report	12-item survey; likert items of 4-point scale (not at all to very well); item format "How well could you do each of the following at the beginning of the school year? Now?"	Science process skills, problem solving skills, and skills in working and communicating with others	PSC students (n=90)	May 2005	Dependent-samples t test
Parent Survey	13-item survey; likert items on 4-point scale (strongly agree to strongly disagree)	Cognitive and affective program outcomes; program satisfaction; areas for program improvement	Parents of PSC students (n=52)	March 2005	Descriptive statistics

Evaluation Results

1. Have the students attained grade-level proficiency in science, math, and writing?

- PSC students' scores on the Minnesota Comprehensive Assessments in reading, math, and writing were not significantly different from their peers in traditional ISD 544 classrooms. *
- PSC students scored above or equal to the state averages on the Minnesota Comprehensive Assessments in reading.
- PSC students scored above the state averages in three out of four categories in math; they scored below the state average in one math category (number sense, chance, and data). PSC peers in traditional ISD 544 classrooms also scored below the state average in this area of math.
- PSC students scored above the state averages in all five areas of descriptive writing and in one of five areas of both problem solution writing and clarification writing. Their scores were equal to the state average in one area of problem solution writing. However, PSC students scored below state averages in all five areas of narrative writing.
- According to anecdotal evidence collected from student writing samples, PSC students felt they have learned science, math, and writing concepts and skills and described this learning as stronger than in previous school years; they attributed this to increased frequency of the real-world applications of science, math and writing using the prairie wetlands environment.
- Of the PSC parents who completed the survey, 98% felt their children learned science, math, and writing concepts and skills better than they would have in a traditional classroom.

* Lack of pre-test data prevents us from determining if PSC students began with higher achievement levels than their peers in traditional classrooms. However, by scoring at levels at or above their peers, we do know that with participation in the PSC and its nontraditional learning environment, students' academic performance in traditional subject areas was at levels that are acceptable or higher to the state except in one area of math and in a total of 12 of 20 areas of writing. Further, parents and students felt participation in the PSC led to growth and learning in the traditional subject areas. This sense of academic self-efficacy is also an indicator of positive impact on learning and achievement, as academic self-efficacy has research-based links to academic achievement.

Student Voices

"I learned science is way cooler to learn it up close than from a book. I learned more responsibility and how if you're quiet you can see things everywhere."

"This year we went outside and did observations. We don't sit in a chair mostly all the time we are here. I learned things I didn't know about animals and the ecosystem. I couldn't even spell 'ecosystem' without looking."

"Everything we do is different. We go outside to learn. In 4th grade, we would go outside for fun with no mission. I'm different now because when we are in the car my sister and brothers would listen to CD players and I put down my window and just listen and look at nature."

Parent Voices

"I can't say enough about this program. What an opportunity for kids. I wish this was an option for sixth graders also. I would definitely enroll my child again. Thank you!"

"My child developed lasting organizational skills and was extremely motivated to learn and share all his new discoveries. What an exceptional program. This is how learning should be."

"My daughter said, 'This is the best year of school in my life, and it is going so fast.' What an amazing opportunity for learning. We wish our 2 older kids would have had this experience. Instead of the self-teaching I see, where the kids spend all their time answering questions on work sheets, they are getting actual hands-on learning."

2. Have the students' science process, problem solving, and their skills in working cooperatively and communicating with others increased?

- On all 12 items on the student skill self-report, data showed a positive, statistically significant increase ($p < .001$) in students' assessments of their science process, problem solving, and their skills in working cooperatively and communicating with others (see table below).*

Summary of Average Responses on the Skill Self-Report

How well could you do each of these things?	Beginning of School	End of the School
1. Observe the environment around me.	A Little	Very Well
2. Read the land.	A Little	Pretty Well
3. Make a close guess about why something in nature happens.	A Little	Pretty Well
4. Collect data to answer a research question.	A Little	Very Well
5. Ask questions to find out more information.	A Little	Pretty Well
6. Think about what I have done to help me learn.	A Little	Pretty Well
7. Work with others as a team in small groups.	Pretty Well	Very Well
8. Use field equipment to gather information.	A Little	Very Well
9. Identify plants and animals that live at PWLC.	A Little	Very Well
10. Share my ideas with others through writing.	A Little	Pretty Well
11. Learned math, science, and writing.	A Little	Very Well
12. Understood the environment.	A Little	Very Well

*Without a control group, it cannot be determined if this growth in skills was due to participation in the PSC or to cognitive maturation over the school year. Based on survey results, parents attributed skill growth to instructional strategies (the field-based setting, for example) that are not a part of the traditional classroom experience. Further, perceived growth in these skill areas is important, as it indicates academic self-efficacy, which does have research-based links to academic performance.

Students surveyed for snow fleas on a warm winter day.

Student Voices

"I enjoyed this year and learned in a different and fun way. I liked learning from the environment and seeing it rather than reading it. I am different because PSC changed me in a good way. I am more observant and notice more things and being able to think about it in a scientific way."

"This year we went outside to find things out. Also, this year we could see things in real life (not just in a book). I know more about nature now. I know a lot of new words now."

"Well, now in the 5th grade I get to work outside more than in the 4th grade. I don't just have to read from a book. I get to do it. I am different because I understand things so much better because I get to experience it."

"This year I learned that the environment has a better way of teaching than a regular school, and we go outside each day. I notice little things like a bird sitting on a nest and I wonder how long has it been on the nest, what kind of bird is it, how long will it take for them to hatch?"

"It is a lot more fun because we get to go outside every day. We get to study plants and animals. I'm different because I used to just kick the plants. When I saw ducks fighting I didn't look at it well."

"Now I know what animals and plants are. I know how to do a lot more things outside than I ever have before. I like to go outside more than I used to. I'm not bored in school and I don't have a hard time with it anymore."

3. Do the students have a more positive attitude toward learning, a more positive attitude toward the prairie wetlands environment, a stronger stewardship ethic, and a stronger sense of civic responsibility than their peers in traditional classrooms?

- Written comments provided by students and parents indicate students felt the PSC helped them become more interested in school and learning. Students also felt the PSC improved their classroom behavior and environmental stewardship and promoted a sense of belonging or community. They stated the PSC helped them learn responsibility, teamwork, respect, confidence, to achieve goals, and to be kind to other people.
- Of the PSC parents who completed the survey, 96% agreed that their children were more excited about school because of the PSC. One hundred percent agreed that their children expressed a positive attitude toward the PSC and 96% agreed that students were interested in discussing at home what they were learning in the PSC. Ninety-eight percent felt their children benefited in ways that could not be achieved through a traditional program. Written comments from the parent surveys support these findings, as parents described the PSC as motivating their children toward learning.

Parent Voices

"This was a wonderful opportunity to open my daughter's eyes/mind to nature. She would love to take classes at PWLC in 6th grade and beyond if possible. I think making this experience mandatory for 5th graders is a great idea. We need to teach children of this age to be observant/respectful of nature."

"Wish there was an option for 6th graders. I am concerned about my child next year being in a traditional classroom, indoors all day, after this hands-on learning."

"Both of our boys have had the opportunity to attend PWLC. Hands-on learning makes such a big difference. It not only improved their science knowledge, but also writing skills. We will miss it next year."

"This experience will stay with my child forever. I have no idea what I learned in 5th grade, but I know my child will remember!"

"We are very happy our children were in the Prairie Science Class. Their love for science really shows after experiencing it hands on. It amazes me all the information they are so excited to share with us. It's great. It's too bad the entire 5th grade can't experience it. Thanks to all the great teachers and PSC staff!"

"I am an educator in Fargo and I can't say enough positive about PWLC. I have shared this program with many of my peers and they also feel that this would be a wonderful way to have that 'alternative education' at the elementary level as well as high school. I am 100% behind this and feel that it could even work as a full day school. I would love to teach in this type of hands-on setting. What an awesome way for children to learn."

"The Prairie Science Class was also great for keeping our kids physically fit! -In the great outdoors. Awesome! Keep it up."

Student Voices

"And I probably changed by learning how to learn, it may sound crazy but it's true. We learned how to teach others how to learn too. We taught fifth and fourth graders. We've even taught teachers! But everyone has had a lot of fun this year."

"But what I think is the best thing is that I learned is that the prairie is calm and quiet and my favorite place to be. And how I've changed is mainly that I've learned how to treat the animals and plants with kindness."

"I've learned that nature is much more than I have thought. Nature is beauty, wonder, and biodiversity. Nature is home to many animals and plants. Nature is my school, and a fantastic place full of discoveries. Learning at the PSC can be hard. So many places to go, things to learn. It can be overwhelming. But relaxation is the tip. Be a naturalist, and relax. That's what I've learned about learning. It takes time, and effort to be a naturalist, but in the end, it's worth it! During my year at the PSC, I've changed in many different ways: I know more about nature and the prairie, I've become a better observer, and I can definitely be more quiet! The way I've changed makes a big difference in the way I act, sound, and observe. Studying in nature is a very important thing in my life."

"I've also learned how to learn by concentrating and paying attention in class. I've learned that science can be very interesting because if you pay attention, you'll realize you can learn a lot from science. It's the same with math and language arts."

4. Did the Prairie Science Class meet the needs of the students and parents, the Fergus Falls ISD 544, and the U.S. Fish and Wildlife Service?

- According to written comments provided by students, they described their PSC experience as positive and as something they would recommend to others. Students also expressed the desire to participate in the PSC as 6th graders and recommended that it should be expanded so that more students could participate.
- According to results of the parent survey, parents were overwhelmingly positive about their children's experiences with the PSC. Ninety-eight percent of the respondents had a positive impression of the effects of the PSC on their children and would recommend the program to others. All of the respondents felt the PSC should be continued and that the PWLC is an appropriate place for the PSC. Ninety-eight percent of respondents thought the PSC should be expanded to include additional students.
- Based upon continued and growing support from ISD 554, the PSC continues to meet the needs of ISD 544. The school district continues to advocate for a bonding bill to the state legislature and governor which would fund building expansion and double attendance in the PSC. The PSC is also planning to expand university partnerships for increased student teacher involvement through the school year in the PSC.
- Based upon continued and growing support from the USFWS, the PSC continues to meet the needs of the USFWS. According to the results of the parent survey, 96% of respondents indicated that their child's involvement in the PSC motivated their family to visit the PWLC, supporting local outreach into the community.

Students assisted with prairie restoration efforts by identifying and collecting seeds from various species in fall and studying seeded plots.

Parent Voices

"I feel all 5th graders of the FF public schools should be a part of this program."

"Would love to see it continued into 6th grade and to spend full days out there or at least more hours."

"I would love to see PWLC continue to 6th, 7th, and 8th grade. Awesome class – I've learned a lot from my child."

"We have been extremely impressed by the entire Prairie Science Class program – the teachers, Prairie staff and curriculum is incredible."

"I wish there could be a class like this for every grade at the middle school. Our son has really enjoyed it and has impressed his dad and I with the things he has learned."

"Awesome teachers, environment, opportunity to learn!"

"Please keep this class going – my child has learned so much from it."

Student Voices

"(The most important thing I learned was) to have an open eye to nature that will effect me even when I grow up. I've learned to be very observant and to be able to shift gears to listen right away."

"The most important thing I learned was to work together as a team."

"I learned that you will see something new and interesting very day. I also learned that in spring you should stay on the trail because of the animals nesting in the grass."

"(I would describe my year in the PSC as) simply wonderful. It's really made me a new me. I've learned many new things. But the thing that at the beginning of the year I thought, "It's going to be boring." But I found out that I was wrong!

Students watch in anticipation as they release a mallard after measuring and banding it.

Students conduct a population census as part of their prairie restoration project.

In fall, students study, identify, and measure Big 3 Grasses (big bluestem, little bluestem, and sideoats gramma).

Stakeholder Voices

"This last school year we were able to double the PSC program, and it still is not enough! We now have at least 100 students involved with this program each and every day, and they are loving it! With the addition of a second teacher at the PWLC we have now developed an instructional environment that has served to offer innovation and curriculum growth throughout this entire school year. Under the leadership of Mr. Dave Ellis and Mrs. Becky Greenagel they continue to improve this program and offer environmental learning opportunities for these young people. We continue to look for ways to expand this program and duplicate these positive results for more of our students."
- Middle School Principal

"I firmly believe that the Prairie Science Class is a model the Fish and Wildlife Service should embrace and "grow" as its niche in the Environmental Education arena. It cannot be done everywhere, but pursuing this model or its variations on National Wildlife Refuge lands should be a proactive Fish and Wildlife Service goal. We in the Midwest Region remain committed to further this goal for the future stewards of the National Wildlife Refuge System."
-Region 3 Chief of the National Wildlife Refuge System

"Students who spend hours every day of the school year engaged in learning through the outdoor environment and all it represents to humans will become environmentally responsible adults. The Prairie Science Class has brought forth a new paradigm for environmental education programs on National Wildlife Refuges within the U.S. Fish and Wildlife Service. The PSC exemplifies the public expectation that schools, local, state and the federal governments can meet their goals while working in partnership to train future adults in the importance of sustaining their environment."
- Fergus Falls Wetland Management District Project Leader

"This unique program is proving what environmental educators have felt for years – that using the natural environment for teaching multiple subjects is an effective way for students to learn not only science and the environment, but math, literature and more. We are excited about the PSC and the model it has provided for changing the way we do environmental education."
- Prairie Wetlands Learning Center Supervisory Park Ranger

Conclusion

Due to staff and time constraints, the evaluation of the second school year of the PSC was less comprehensive than the first year with the exception of additional analysis of Minnesota Comprehensive Assessment scores in writing. Because the PSC expanded to accommodate more students, enrollment doubled in this second school year of the program, thus doubling our available data set of participating students and parents. Primarily due to this increased enrollment in the PSC, academic diversity of student constituency increased. Other factors contributing to a more heterogeneous mix included publicity from the first school year and increased popularity which resulted in increased parent interest. (Parent choice plays a key role in student selection along with other factors considered by school guidance counselors.)

The results of this evaluation reinforce findings of the first year which suggested positive cognitive and affective outcomes, including concept attainment and skill development in science, and math; growth in problem solving and skills in working and communicating with others; and positive influences on students' motivation toward learning, attitudes toward the prairie wetlands environment, and stewardship ethic. Further, both ISD 544 and USFWS stakeholders indicate the PSC is accomplishing their respective missions and goals in a meaningful, quality way. Given these findings, continuation of this program is appropriate.

Formative evaluation is an important tool for program advancement. This year's evaluation indicated needed improvements, especially in writing. Specific suggestions for improvements are described in the "Recommendations" section of this report.

These findings are also consistent with research on other educational programs that use the environment as an integrating and motivating context as specified in the PSC 2003-2004 Evaluation Report. A growing volume of additional new research may be accessed at http://www.peecworks.org/PEEC/PEEC_Research, the Place-Based Education Evaluation Collaborative web site. Previous research and the findings from the PSC evaluations demonstrate that integrated learning using authentic, field-based experiences makes sense, with positive outcomes for students and the partnering organizations.

Recommendations

The data collection tools and information provided by stakeholders collectively generated several areas for potential program improvement. Students suggested the creation of more programs like the PSC, that the prairie should be shared with everyone, and that "you can never spend too much time outdoors." Parent suggestions included expanding daily hours or full day involvement, expanding enrollment to all students in 5th and/or 6th grade or at least giving priority in 6th grade to those who could not participate in 5th grade, expanding through 8th grade and elementary school, increasing student supervision on the bus rides between the middle school and PWLC, and increased time spent outside.

Findings from this program evaluation and information from stakeholders also provided recommendations for future implementation:

- *Expand the PSC.* PSC stakeholders should expand and improve the PWLC visitor center which would create needed space to accommodate a significant enrollment increase in the PSC. A building addition should provide more classrooms, storage, and assembly space. A small greenhouse and wet lab would expand prairie restoration and wetland investigation opportunities. Stakeholders should assess whether enrollment should increase to encompass an entire grade level or equal parts of two grade levels.

- *Refine curriculum and improve student academic learning, particularly in writing.* As the PSC continues, school district teachers make new discoveries and should continue to refine curriculum to meet student needs, allow for a greater constructivist approach, and integrate larger concepts. MCA test scores indicate the greatest need for academic improvement is in three of four areas of writing.

- *Continue and expand evaluation and monitoring of student progress*. Given a continued emphasis on educational accountability and limited financial and staff resources, evaluation still plays a key role in justifying the effort and resources that are being expended. Documentation of program outcomes and operations is also integral in achieving program support locally, regionally, and nationally. With ISD 544's expanded use of Measures of Academic Progress testing to fifth grade, evaluation of the PSC should expand to track individual student progress in several subject areas and quantify the impact of the PSC on participating students. With a growing availability of data over time, careful development should establish a long-term evaluation plan which examines longevity of results and addresses internal issues amongst some school district staff regarding use of a control group.

- *Professional development of teachers*. Along with the administrative support of ISD 544 and the USFWS, PSC teachers played a key role in the success of the program. Through development of a formal partnership with colleges, there is a need to train formal educators

and environmental educators in integrated, field-based teaching methods if the PSC is to be replicated or adapted in other school districts and at other natural areas.

In addition, this evaluation reinforces areas for further exploration as detailed in the first year report:

- *Characteristics of successful partnerships*. Stakeholders collectively agree the PSC is an example of a successful partnership. Evaluation of the 2005-2006 PSC should incorporate a more systematic look into what makes this partnership work. This would be a key piece for program replication with other school districts and units of the National Wildlife Refuge System.

- *Teacher Qualifications.* As indicated last year, parents and stakeholders agreed some of the program success can be attributed to the PSC teachers. It would be useful to know what teacher characteristics contributed to this success and would help prepare other teachers to instruct in these non-traditional settings, which is another key piece for program replication.

- *Applications to Other Educational Programs*. The PWLC and other units of the NWRS should examine how the philosophy and operations of the PSC could be applied to existing educational programs. Successful elements such as repeat contact with students, field-based experiences, and a constructivist approach would strengthen existing programs as demonstrated by results of this evaluation and other research.

With a sense of awe and wonder, students closely examine the texture and appearance of stiff goldenrod while searching for migrating monarch butterflies to capture and tag.

This report was prepared by PWLC staff Molly Stoddard, Laura Bonneau, and Ken Garrahan with guidance from Dr. Julie Ernst, a former environmental education specialist for the USFWS. Evaluation questions can be directed to her at jernst@d.umn.edu. General program questions can be directed to PWLC Supervisory Park Ranger Ken Garrahan (218-736-0938 or ken_garrahan@fws.gov) or Principal Dean Monke (218-998-0544 or dmonke@fergusfalls.k12.mn.us).